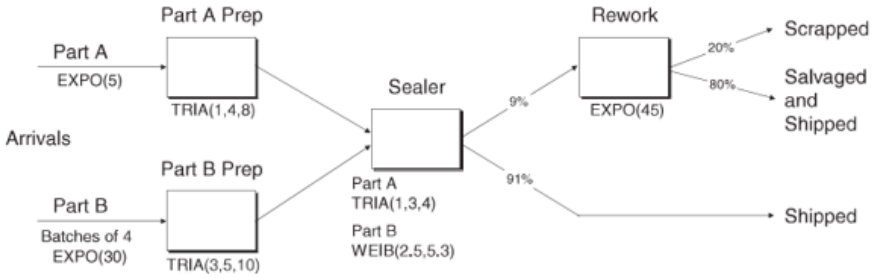
Lab1: Simulations

This system represents the final operations of the production of two different sealed electronic units, shown in Figure 4-1. The arriving parts are cast metal cases that have already been machined to accept the electronic parts.

The first units, called Part A, are produced in an adjacent department, outside the bounds of this model, with interarrival times to our model being exponentially distributed with a mean of 5 (all times are in minutes). Upon arrival, they're transferred (instantly) to the Part A Prep area, where the mating faces of the cases are machined to ensure a good seal, and the part is then deburred and cleaned; the process time for the combined operation at the Part A Prep area follows a TRIA(1, 4, 8) distribution. The part is then transferred (instantly, again) to the sealer.

The second units, called Part B, are produced in a different building, also outside this model's bounds, where they are held until a batch of four units is available; the batch



is then sent to the final production area we are modeling. The time between the arrivals of successive batches of Part B to our model is exponential with a mean of 30 minutes. Upon arrival at the Part B Prep area, the batch is separated into the four individual units, which are processed individually from here on, and the individual parts proceed (instantly) to the Part B Prep area. The processing at the Part B Prep area has the same three steps as at the Part A Prep area, except that the process time for the combined operation follows a TRIA(3, 5, 10) distribution. The part is then sent (instantly) to the sealer.

At the sealer operation, the electronic components are inserted, the case is assembled and sealed, and the sealed unit is tested. The total process time for these operations depends on the part type: TRIA(1, 3, 4) for Part A and WEIB(2.5, 5.3) for Part B (2.5 is the scale parameter β and 5.3 is the shape parameter α; see Appendix C). Ninety-one percent of the parts pass the inspection (that is, each part has a 0.91 probability of passing inspection) and are transferred immediately to the shipping department; whether a part passes is independent of whether any other parts pass. The remaining parts are transferred instantly to the rework area where they are disassembled, repaired, cleaned, assembled, and retested. Eighty percent of the parts processed at the rework area are salvaged (that is, each part at this point has a 0.80 probability of being salvaged) and transferred instantly to the shipping department as reworked parts, and the rest are transferred instantly to the scrap area. The time to rework a part follows an exponential distribution with mean of 45 minutes and is independent of part type and the ultimate disposition (salvaged or scrapped).

We want to collect statistics in each area on resource utilization, number in queue, time in queue, and the cycle time (or total time in system) separated out by shipped parts, salvaged parts, or scrapped parts. We will initially run the simulation for four consecutive 8-hour shifts, or 1,920 minutes.